The rejections:

Claims 1, 2, 5, 6, 9 and 10 under 35 U.S.C. § 102(b) as anticipated by Nolte. Paragraph 3 of the Action.

These same claims under 35 U.S.C. § 102(e) as anticipated by Helmer-Metzmann "as evidenced by Nolte". Paragraph 4 of the Action.

Claims 3, 7 and 11 under 35 U.S.C. § 103(a) as being unpatentable over Nolte. Paragraph 6 of the Action.

These same claims under 35 U.S.C. § 103(a) as being unpatentable over Helmer-Metzmann. Paragraph 7 of the Action.

The Examiner's reading and application of the prior art are set forth in the Action and will not be repeated here except as necessary to an understanding of Applicants' traversal.

Traversal

Claim 1 of the present application calls: "A polymer electrolyte membrane obtained by subjecting an ion-conducting, aromatic polymer membrane to a hot-water treatment , said ion-conducting, aromatic polymer membrane having a maximum water absorption in a range of 80-300 weight % based on its dry weight before the hot-water treatment."

One major distinguishing feature of the claimed invention is that the ion-conducting, aromatic polymer membrane has a maximum water absorption in a range of 80-300 weight % based on its dry weight before the hot-water treatment. This feature is obtained by subjecting an ion-conducting, aromatic polymer membrane to hot-water treatment, another distinguishing feature of the claimed invention.

Although the Examiner states in Paragraph 3, lines 5-6, of the Action, that:

> "The sulfonated poly(arylene ether sulfones) is also treated in hot water (ca. 80°C). See Abstract, page 211-213 "(of J. of Membrane Sci., 83 (1993) (Nolte)).

However, Nolte merely discloses that:

> "For further purification the sulfonated PSU (poly(arylene ether sulfones) was extracted in a Soxhlet system with hot water (ca. 80°C) (see page 213, left column, lines 17-19." -note, some matter in parentheses added for the RESPONSE.

Thus, the hot water treatment of Nolte is carried out to purify the sulfonated poly(arylene ether sulfones) by extracting water soluble moieties (such as low molecular weight sulfonated poly(arylene ether sulfones), polymer segments of poly(arylene ether sulfones), etc., presumably formed by decomposition of poly(arylene ether sulfones) during sulfonation by the solution formation of PSU (Udel P-1700) using chlorosulfonic acid in the presence of trimethylchlorosilane, followed by the decomposition of the reaction mixture with methanol (see Scheme 1) or in sulfonation by the slurry procedure of PES (Victrex PES 5200P) using sulfur trioxide (see Scheme 2).

In the case of PSU, 47.9 g of the recovered sulfonated PSU is purified to 2.8 g of sulfonated PSU by Soxhlet extraction of water soluble moieties contained in the recovered sulfonated PSU (see page 213, left column, lines 16-21). Further, membranes cast from sulfonated PSU solution were completely water soluble, and, accordingly, the PSU-membranes

"are not considered" in the discussion in Nolte (see page 214, right column, the last paragraph, last 8 lines).

In the case of PES, 60.4 g of the recovered sulfonated PES is purified to 53.7 g of sulfonated PES by Soxhlet extraction of water soluble moieties contained in the recovered sulfonated PES (see page 213, right column, lines 1-6). It appears that membranes cast from sulfonated PES solution are not subjected to "a hot treatment".

This means that the hot water treatment of Nolte in a Soxhlet system is carried out to purify the recovered sulfonated poly(arylene ether sulfones) from the sulfonation of poly(arylene ether sulfones) and is not "a hot-water treatment" of the sulfonated poly(arylene ether sulfones).

Accordingly, Applicants respectfully submit that one of ordinary skill in the art, referring to Nolte, which teaches purification of sulfonated poly(arylene ether sulfones) by Soxhlet extraction, but fails to teach or suggest any hot-water treatment of a sulfonated poly(arylene ether sulfone) membrane, would not find the claims of the present application anticipated by Nolte nor obvious over Nolte.

The patentability of the remaining claims rejected as anticipated is believed clear from the above discussion regarding claim 1.

Applicants now address the anticipation rejection based on Helmer-Metzmann as evidenced by Nolte.

In Paragraph 4, lines 5-8 of the Action, Helmer-Metzmann et al (Helmer-Metzmann) describes that:

> "[The] chorosulfonated material is suspended in water and the suspension is boiled (a hot water treatment) so that the polyarylene sulfine-sulfonic acid chloride is converted into the polyarylene sulfide-sulfonic acid (see column 2, lines 64-67)."

The step "the suspension is boiled" in the above seems to clearly mean that the suspension of the chlorosulfonated material in water is decomposed to the polyarylene sulfide-sulfonic acid by heating at 100°C, i.e., the chlorosulfonated material is hydrolyzed to polyarylene sulfide-sulfonic acid by water (emphasis added). Thus, "the suspension is boiled" in Helmer-Metzmann is not believed to be "a hot-water treatment" by immersion in a hot water at 80-95°C for 0.5-5 hours as disclosed in the present invention (see page 12, lines 12-14 of the specification), rather, is a "hydrolysis" in boiling water for a period of 15 hours (see column 3, lines 46-47).

In contrast to Helmer-Metzmann, in the present invention an ion-conducting, aromatic polymer membrane having a high initial water content is converted to a polymer electrolyte membrane having a low dependency of ion conductivity on humidity by a hot-water treatment (see page 5, lines 3-6 of the specification).

Accordingly, Applicants submit that one of ordinary skill in the art, referring to Helmer-Metzmann, which fails to teach or suggest a hot-water treatment of an ion-conducting, aromatic polymer membrane having a high initial water content would not find that the limits of claim 1 of the present application taught, and accordingly, claim 1 is not anticipated by Helmer-Metzmann nor rendered obvious by Helmer-Metzmann.

> "[The] chorosulfonated material is suspended in water and the suspension is boiled (a hot water treatment)... so that the polyarylene sulfine-sulfonic acid chloride is converted into the polyarylene sulfide-sulfonic acid (see column 2, lines 64-67)."

The step "the suspension is boiled" in the above seems to clearly mean that the suspension of the chlorosulfonated material in water is decomposed to the polyarylene sulfide-sulfonic acid by heating at 100°C, i.e., the chlorosulfonated material is hydrolyzed to polyarylene sulfide-sulfonic acid by water (emphasis added). Thus, "the suspension is boiled" in Helmer-Metzmann is not believed to be "a hot-water treatment" by immersion in a hot water at 80-95°C for 0.5-5 hours as disclosed in the present invention (see page 12, lines 12-14 of the specification), rather, is a "hydrolysis" in boiling water for a period of 15 hours (see column 3, lines 46-47).

In contrast to Helmer-Metzmann, in the present invention an ion-conducting, aromatic polymer membrane having a high initial water content is converted to a polymer electrolyte membrane having a low dependency of ion conductivity on humidity by a hot-water treatment (see page 5, lines 3-6 of the specification).

Accordingly, Applicants submit that one of ordinary skill in the art, referring to Helmer-Metzmann, which fails to teach or suggest a hot-water treatment of an ion-conducting, aromatic polymer membrane having a high initial water content would not find that the limits of claim 1 of the present application taught, and accordingly, claim 1 is not anticipated by Helmer-Metzmann nor rendered obvious by Helmer-Metzmann.

With respect to the remaining claims rejected, their patentability is believed clear from the above discussion regarding claim 1.

Applicants now address the obviousness rejection based on Nolte.

In addition to the earlier discussion regarding Nolte, Nolte fails to teach or suggest a hot-water treatment of membranes cast from sulfonated poly(arylene ether sulfones) - by immersion in hot water at 80-95°C for 0.5-5 hours as recited in claims 3, 7 and 11 of the present application.

Accordingly, Applicants respectfully submit that one of ordinary skill in the art, referring to Nolte, would not be motivated to reach the invention as claimed in claims 3, 7 and 11 and said claims are not obvious over Nolte.

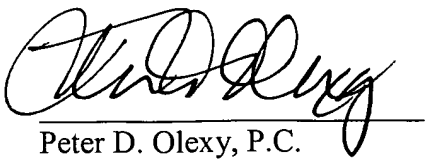
Applicants now address the obviousness rejection based on Helmer-Metzmann.

As earlier discussed, the step of "the suspension in water is boiled" to carry out hydrolysis of the chlorosulfonated material in boiling water for a period of 15 hours to obtain the polyarylene sulfide-sulfonic acid disclosed in Helmer-Metzmann is completely different from the step "a hot-water treatment" by immersion in a hot water at 80-95°C for 0.5-5 hours to convert an ion-conducting, aromatic polymer membrane having a high initial water content to a polymer electrolyte membrane having a low dependency of ion conductivity on humidity as disclosed and claimed in the present application.

Accordingly, Applicants respectfully submit that one of ordinary skill in the art, referring to Helmer-Metzmann, which is silent regarding any hot-water treatment of a polyarylene sulfide-sulfonic acid membrane would not be motivated to reach the invention recited in claims 3, 7 and 11, and accordingly, said claims are not rendered obvious by Nolte.

Withdrawal of all rejections and allowance is requested.

Respectfully submitted,



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